PCT/IB04/[illegible]

Sertifikaat

REPUBLIEK VAN SUID AFRIKA

PATENT KANTOOR
DEPARTEMENT VAN HANDEL
EN NYWERHEID

Certificate

REPUBLIC OF SOUTH AFRICA

PATENT OFFICE
DEPARTMENT OF TRADE AND
INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that

the documents attached hereto are true copies of Forms P1, P2 and provisional specification and drawing of South African Patent Application No. 2003/5203 in the name of Schaueburg Flexadux (Pty) Ltd

Filed : 4 July 2003

Entitled : Gas Monitoring Apparatus

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH
RULE 17.1(a) OR (b)

Geteken te **PRETORIA** in die Republiek van Suid-Afrika, hierdie 23 th dag van **June 2004**

Signed at **PRETORIA** in the Republic of South Africa, this 23 th day of **June 2004**

.....
Registrar of Patents

FORM P.2

REPUBLIC OF SOUTH AFRICA	REGISTER OF PATENTS	PATENTS ACT, 1978

OFFICIAL APPLICATION	LODGING DATE: PROVISIONAL	ACCEPTANCE DATE
21 (11) 2003/5203	22 4 JULY 2003	47
INTERNATIONAL CLASSIFICATION	**LODGING DATE: COMPLETE**	**GRANTED DATE**
51	23	

FULL NAME(S) OF APPLICANT(S)/PATENTEE(S)

71 SCHAUENBURG FLEXADUX (PTY) LTD

APPLICANTS SUBSTITUTED:	DATE REGISTERED
71	

ASSIGNEE(S)	DATE REGISTERED
71	

FULL NAME(S) OF INVENTOR(S)

72 1. KONONOV, VALERY ALEXANDROVICH
2. DE BEER, MATHYS JOHANNES

PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
N.B. Use International abbreviation for country (see Schedule 4)	33 NIL	31 NIL	32 NIL

TITLE OF INVENTION

54 GAS MONITORING APPARATUS

ADDRESS OF APPLICANT(S)/PATENTEE(S)

145 TEDSTONE ROAD, WADEVILLE, 1407, GAUTENG, SOUTH AFRICA

ADDRESS FOR SERVICE	S & F REF
74 **SPOOR & FISHER, SANDTON**	PA135563/P

PATENT OF ADDITION NO.	DATE OF ANY CHANGE
61	
FRESH APPLICATION BASED ON	**DATE OF ANY CHANGE**

SPOOR & FISHER'

REPUBLIC OF SOUTH AFRICA
REVENUE

FORM P.1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT

AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30 (1) – Regulation 22)

04/07/03

R 0060.00

HASR 711

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

REPUBLIEK VAN SUID AFRIKA

OFFICIAL APPLICATION NO.		S & F REFERENCE
21 01	2003/5205	PA135563/P

FULL NAME(S) OF APPLICANT(S)	
71	SCHAUENBURG FLEXADUX (PTY) LTD

ADDRESS(ES) OF APPLICANT(S)	
	145 TEDSTONE ROAD, WADEVILLE, 1407, GAUTENG, SOUTH AFRICA

TITLE OF INVENTION	
54	GAS MONITORING APPARATUS

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. THE EARLIEST PRIORITY CLAIM IS:

COUNTRY:	NUMBER:	DATE:
NIL	NIL	NIL

~~THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.~~

21	01	

~~THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.~~

21	01	

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. A single copy of a provisional specification of 7 pages.
- ☒ 2. Drawings of 1 sheet.
- ☐ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☐ 4. A copy of Figure of the drawings (if any) for the abstract.
- ☐ 5. Assignment of invention.
- ☐ 6. Certified priority document.
- ☐ 7. Translation of the priority document.
- ☐ 8. Assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No .
- ☐ 10. Declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.
- ☐ 14. Other.

74 ADDRESS FOR SERVICE: SPOOR & FISHER, SANDTON

Dated: 4 July 2003

SPOOR & FISHER
PATENT ATTORNEYS FOR THE APPLICANT(S)

RECEIVED

REGISTRAR OF PATENTS

SPOOR & FISHER

FORM P.6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO.		LODGING DATE	
21	01 2003/5203	22	4 JULY 2003

FULL NAMES OF APPLICANTS

71	SCHAUENBURG FLEXADUX (PTY) LTD

FULL NAMES OF INVENTORS

72	KONONOV, VALERY ALEXANDROVICH DE BEER, MATHYS JOHANNES

TITLE OF INVENTION

54	GAS MONITORING APPARATUS

Gas Monitoring Apparatus

BACKGROUND OF THE INVENTION

THIS invention relates to gas monitoring apparatus which can be used, for example, in underground mines.

Gas monitoring apparatus is known which comprises a housing which supports one or more gas sensors, an electronic processing circuit, and a display. The apparatus is typically battery powered and portable.

A common use for such apparatus is to measure the concentration of gases in a mine working. Certain gases, such as methane, are lighter than air and tend to collect near the roof of a working. It is therefore common to mount the apparatus at the end of a pole and to hold it up near the roof to take a gas concentration reading. Under these circumstances, it can be difficult to read the display on the apparatus. If the apparatus has a memory function which stores the highest or most recent gas concentration reading on the display, a reading can be taken and the device brought back down from the roof to examine the display. However, this can lead to inaccurate readings as the gas concentration may vary from location to location.

It is an object of the invention to provide alternative gas monitoring apparatus.

SUMMARY OF THE INVENTION

According to the invention there is provided gas monitoring apparatus comprising:

a first housing;

at least one gas sensor in the first housing;

measurement means in the first housing responsive to said at least one gas sensor to generate an output indicative of a measured gas concentration;

a transmitter in the first housing arranged to transmit signals indicative of the measured gas concentration;

a second housing;

a receiver in the second housing arranged to receive the signals indicative of the measured gas concentration; and

a display supported by the second housing for displaying the measured gas concentration.

Preferably, the first and second housings are connectable releasably together.

The transmitter in the first housing and the receiver in the second housing are preferably a radio transmitter and receiver.

The apparatus may be battery powered, by respective batteries in the first and second housings.

The batteries may be rechargeable, the first housing being provided with terminals receivable in a charger to charge the battery or batteries in both housings.

Preferably, the apparatus is arranged so that the battery or batteries in the first housing are charged simultaneously with the battery or batteries in the second housing when the two housings are connected together.

In a preferred embodiment of the invention, energy transfer means are provided on the respective housings to transfer sufficient energy from the first housing to the second housing to charge the battery or batteries in the second housing, without requiring electrical contact between the housings.

For example, a light source may be provided in the first housing, arranged to be activated when the first housing is received in a charger, and a photovoltaic cell may be provided on the second housing, the light source and the photovoltaic cell being located adjacent one another when the two housings are connected.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a pictorial view of gas monitoring apparatus according to the invention;

Figure 2 is a simplified schematic block diagram of the electronic circuitry of a receiver module of the apparatus;

Figure 3 is a simplified schematic diagram of a battery charging circuit of the receiver module;

Figure 4 is a simplified schematic diagram of the electronic circuitry of a sensor module of the apparatus; and

Figure 5 is a simplified schematic diagram of a battery charging circuit of the sensor module.

DESCRIPTION OF AN EMBODIMENT

The illustrated gas monitoring apparatus comprises a display module 10 in a housing and a gas sensor module 12 in another housing. The two housings can be connected releasably together. The display module has a pair of outwardly extending flanges on opposed edges thereof, and the sensor module 12 has complemental inwardly extending flanges 18 and 20 on the front face thereof to allow the display module to be slid into position on the front face of the sensor module. The housings of the modules 10 and 12 will typically be moulded from a suitable plastics material.

The sensor module 12 has a pair of gas sensors 22 and 24 on an end surface thereof. For example, the sensors could be sensors for carbon monoxide (CO), oxygen (O_2) or (CH_4). Within the housing is a measurement circuit 26 which is typically microprocessor based, which provides an output related to the concentration of the relevant gases detected by the sensors. Such sensors and measurement circuits are well known as such and are therefore not discussed further in great detail.

Also within the housing of the sensor module 12 is a radio frequency transmitter 28 with an associated antenna 30. (see Figure 4). A set of contacts 32 are provided at the base of the sensor module 12 which make contact with complemental contacts 34 in a battery charging unit 36.

The sensor module is battery powered, typically by means of nickel cadmium (NiCad) or nickel metal hydride (NiMh) batteries 38. When the sensor module is inserted into the charger 36, charging current is supplied to the battery 38 via a blocking diode 40. At the same time, a lamp or LED 42 is illuminated by the charging current.

The lamp 32 is mounted behind a transparent window 44 in the front face of the sensor module, between the flanges 18 and 20. The purpose of this arrangement is explained below.

The display module 10 supports a liquid crystal display (LCD) 44 on a front surface thereof, together with several push buttons 46 or other controls. As indicated in Figure 2, the display module includes a radio frequency receiver 48 with an associated antenna 50, and a microprocessor based processing circuit 52 which controls the display 44.

On the rear surface of the display module 10 is photovoltaic cell 54 which is located so as to be adjacent the window 44 on the front face of the sensor module 2 when the two modules are connected together. The photovoltaic cell 54 is connected to a miniature rechargeable battery 56 which powers the display module, so that when sufficient light is incident on the photovoltaic cell, the battery 56 is charged.

Alternatively, the display module 10 can be charged through an additional or separate charging terminal either by way of the photovoltaic cell or by another charging circuit.

The apparatus can be operated with the display module and the sensor module connected together or physically separated. In either case, outputs from the gas sensor 22 and 24 are converted into gas concentration readings by the processing circuit 26 and a corresponding signal is transmitted wirelessly from the sensor module to the display module. This signal is received, processed and displayed on the LCD 44. Due to the wireless link between the two modules, the display module can be detached from the sensor module, allowing the sensor module to be held at the roof of a mine working on the end of a pole, for example, while the display module can be hand held and thus easily operated and observed by a user.

When the apparatus is placed in a charger with the two modules connected together, the lamp 42 illuminates the photovoltaic cell 54, which typically can generate an output current of 5 mA at about 5 V. This is sufficient to charge a miniature 3 V nickel metal hydride battery. The power consumption of the display is relatively low, requiring only a small battery.

By contrast, the relatively high capacity batteries required to operate the sensor module, which will typically be a 6 V, 2 Ah battery pack, can be charged directly from the charger. Thus, the versatility of the described arrangement is not compromised by the need for a special charging unit, separate chargers for the two modules, or the need to use disposable batteries in the display module.

Dated this 4th day of July 2003

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SPOOR & FISHER
APPLICANT'S PATENT ATTORNEYS

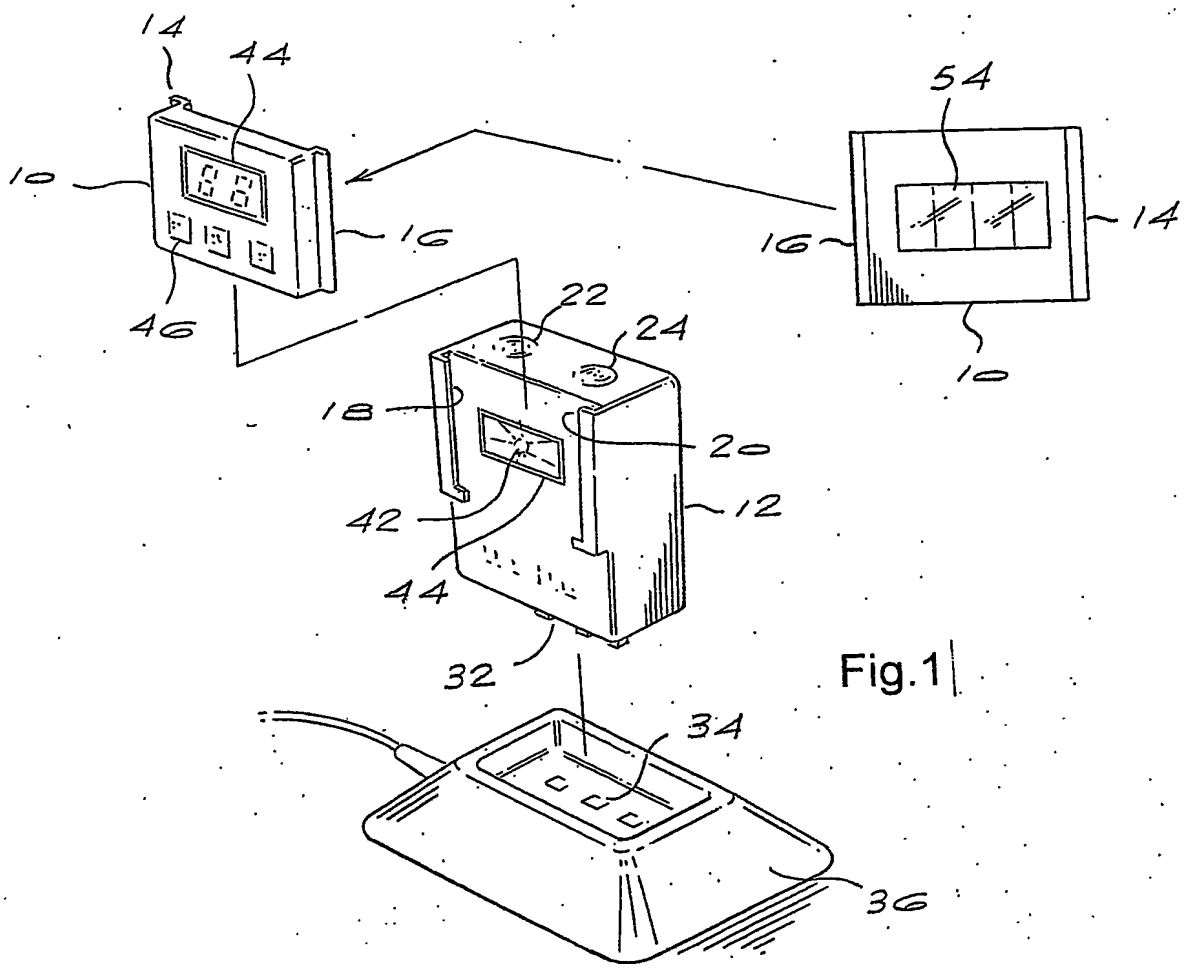


Fig.1

Fig.2

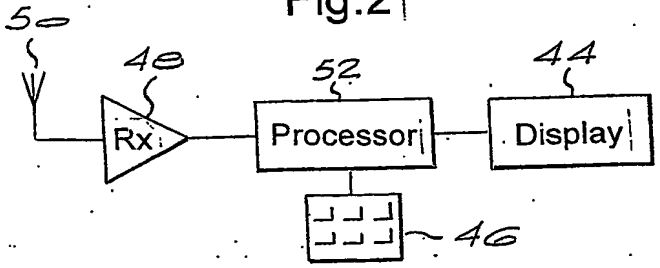
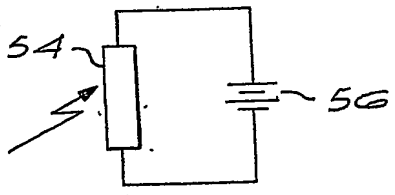


Fig.3



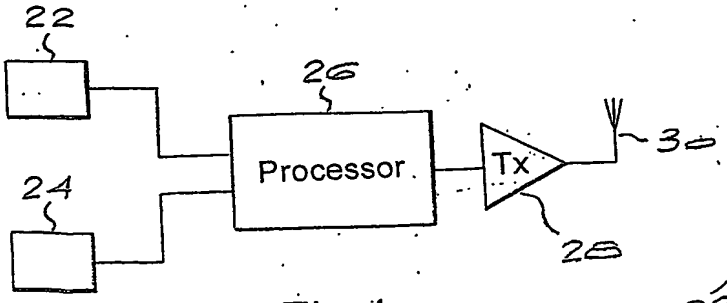


Fig.4

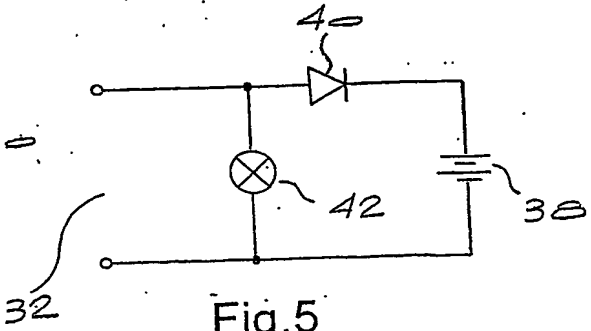


Fig.5

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